

8. HAZARD ASSESSMENT

The overall objectives of this hazards assessment section are to provide guidance on the following:

- Evaluate all well installation and sampling project tasks to determine the extent that existing radiological, chemical, and physical hazards may potentially impact site personnel by all routes of entry
- Establish the necessary monitoring and sampling required to evaluate exposure and contamination levels, determine adequate ALs to mitigate potential exposures, and provide specific actions to be followed if ALs are reached
- Determine engineering controls, isolation methods for core materials, work practices to limit personnel exposure, administrative controls, and appropriate respiratory protection and protective clothing to protect site personnel from hazards.

This HASP has been developed in accordance with MCP-255, "Hazardous Waste Operations and Emergency Response Activity Health and Safety Plans," and follows the hazard identification, evaluation, and mitigation process found in STD-101, "Integrated Work-Control Process."

8.1 Hazard Evaluation of Project Activities

Personnel may be exposed to safety hazards, or to chemical, radiological, and physical agents while working on project tasks. The degree of the hazards posed depends on the nature of contaminants encountered and the specific tasks being performed. Table 8-1 summarizes the anticipated hazards associated with various project activities. The following identifies the contaminants and maximum concentration levels that have been detected in the respective media in the project area (from the OU 3-13 RI/FS [DOE-ID 1997] and OU 3-13 Record of Decision [DOE-ID 1999]) that project personnel could be potentially exposed:

- Contaminants in unconsolidated soil, interbed sediments, and basalts:
 - Gross alpha activity—up to 25 pCi/g
 - Gross beta activity—up to 25 pCi/g
 - Strontium-90—up to 800 pCi/g
- Contaminants in perched water:
 - Strontium-90—up to 320,000 pCi/l
 - Tritium—up to 73,000 pCi/l
 - Technetium—up to 736 pCi/l
 - Nitrate—35.4 mg/L
 - Chloride—250 mg/L

- Manganese—165 ug/L
- Iron—324 ug/L.
- Contaminants in SRPA groundwater:
 - Tritium—up to 30,700 pCi/L
 - Strontium-90—up to 84 pCi/L
 - Iodine-129—up to 3.8 pCi/L
 - Technetium-99—up to 448 pCi/L
 - Magnesium—up to 63 ug/L
 - Chromium and mercury—trace levels

Because the project activities will involve known radiological hazards, a radiation work permit (RWP) will be required in accordance with the *INEEL Radiation Protection Manual*, 15A, and MCP-7, "Radiological Work Permit." The RWP and any safe work permits (SWPs) prepared will be used in conjunction with this HASP to address hazardous and radiological conditions at the site. These permits will augment this HASP and further detail protective measures, protective equipment, and dosimetry requirements.

Table 8-2 presents an evaluation of these radiological and inorganic contaminants with respect to potential routes of exposure and symptoms of over-exposure. Additionally, the exposure potential by all routes is stated based on quantity of material present and toxicity.

8.1.1 Well Installation, Logging, and Sampling Activities

Personnel may potentially be exposed to safety hazards, chemical, radiological, and physical agents while working at the well sites. A potential exists for personnel to come in to contact with contaminants during retrieval of discrete core intervals and water sampling tasks if contaminants have migrated downward and laterally. The magnitude of hazards to personnel entering the work zones depends on both the chemical/radiological nature of the contaminants encountered and nature of the specific tasks being conducted on this project. Engineering controls will be implemented (whenever possible), along with work practice controls, real-time monitoring of contaminants, and site-specific hazard training to further mitigate potential exposures and hazards.

Table 8-1. Project activities and associated hazards.

Activity or Task	Associated Hazards or Hazardous Agent
Mobilization/ demobilization	Biological hazards Industrial safety hazards Flammable material transfer Heat or cold stress Slips, trips, falls, elevated platforms Back strain Noise, heavy equipment, dust
Drilling activities; soil, water and rock sampling; geophysical logging	Industrial safety hazards Hoisting and rigging activities Heat or cold stress Slips, trips, falls Back strain Elevated platforms Noise, heavy equipment, dust Radiological and inorganic contaminants
Well and instrumentation installation	Industrial safety hazards Heat or cold stress Back strain
Equipment decontamination	Industrial safety hazards Heat or cold stress Back strain Noise Radiological and inorganic contaminants

Table 8-2. Evaluation of inorganic and radiological contaminants.

Material or Chemical (CAS No.)	Exposure Limit ^a (PEL/TLV)	Routes of Exposure ^b	Symptoms of Overexposure ^c (Acute and Chronic)	Target Organs/System	Carcinogen (source) ^d	Exposure Potential (all routes without regard to PPE)
Metals and Inorganic Compounds						
Bentonite (sodium bentonite) (7631-86-9)	10 mg/m ³ (inert nuisance dust)	Ih, Con	Mucous membrane and respiratory tract irritation	Lungs	No	Moderate-high potential. Used for well completion
Silica, crystalline (dust) (14464-46-1)	0.05 mg/m ³ (respirable fraction)	Ih, Con	Pulmonary fibrosis, silicosis	Respiratory, eyes	No	Moderate-high potential. Mixing of silica sand and flour for well completion
Silica, crystalline quartz (%SiO ₂ +2) (14464-46-1)	10 mg/m ³	Ih, Con	Pulmonary fibrosis, silicosis	Respiratory, eyes		Moderate-high potential. Mixing of silica sand and flour for well completion
Chromium (7440-47-3)	ACGIH TLV—0.5 mg/m ³	Ih, Ing, Con	Irritation of eyes and skin, lung fibrosis (histologic)	Eyes, skin, respiratory tract	No	Low potential.
Mercury (7439-97-6)	ACGIH TLV—0.025 mg/m ³	Ih, Ing, Con, Abs	Irritation eyes, skin; cough, chest pain, dyspnea, bronchial pneumonitis; tremor, insomnia, irritability, indecision, headache, fatigue, weakness; gastrointestinal disturbance, anorexia, low weight	Eyes, skin, respiratory tract, central nervous system, kidneys	No	Low potential.

Table 8-2. (continued).

Material or Chemical (CAS No.)	Exposure Limit ^a (PEL/TLV)	Routes of Exposure ^b	Symptoms of Overexposure ^c (Acute and Chronic)	Target Organs/System	Carcinogen (source) ^d	Exposure Potential (all routes without regard to PPE)
Radiological Contaminants (The dominant radioisotopes are tritium and strontium-90)						
Radionuclides (whole body exposure)	INEEL-1.5 rem/yr, project ALARA dose limit-per RWP or ALARA task, posting of radiation areas per INEEL RCM	Whole body	Electronic dosimetry will be used to alert workers to increased alpha and beta radiation fields.	Blood forming cells, GI tract, and rapidly dividing cells	Yes—IARC	Low potential. Low doses from repeated handling of sample cores. Also low doses from handling water samples

a. American Conference of Governmental Industrial Hygienists (ACGIH) 1997 TLV Booklet and OSHA 29 CFR 1910 substance-specific standards.

b. (Ih) inhalation; (Ing) ingestion; (Abs) skin absorption; (Con) contact hazard.

c. (nervous system) dizziness/nausea/lightheadedness; (dermis) rashes/itching/redness; (respiratory) respiratory effects; (eyes) tearing/irritation;

d. If yes, identify agency and appropriate designation (ACGIH A1 or A2; NIOSH; OSHA; IARC).

GI = gastrointestinal

PEL = permissible exposure limit

TLV = threshold limit value

rem = roentgen equivalent man

RCM = Radiological Control Manual

IARC = International Agency for Research on Cancer

MSDSs for these chemicals are available at the OU 3-13 Group 5 project location.

8.2 Routes of Exposure

Exposure pathways for hazardous materials and radionuclides are directly related to the nature of the project tasks. The exposure pathways for the radionuclides will be described in the RWP. Engineering controls (high-efficiency particulate air [HEPA]) filtration, continuous monitoring, training, and work controls will mitigate potential contact and uptake of these hazards; however, the potential for exposure to contaminants still exists. During the pre-job and when necessary, the RCT and IH will discuss site-specific contaminant routes of entry.

Exposure pathways include

- Inhalation of radionuclide-contaminated fugitive dusts during intrusive activities and decontamination tasks. This form of exposure may have trace amounts of inorganic compounds and be contaminated with radionuclides resulting in potential lung deposition.
- Skin absorption and contact with radionuclides and inorganic compounds during exposure potential, that can be absorbed through unprotected skin or corrosion, resulting in chemical burns, uptake through skin absorption and/or skin contamination, and type of work will be described in the SWP or RWP.
- Ingestion of radionuclides and inorganic compounds adsorbed to dust particles or waste residues exposure potential, uptake of contaminants through the gastrointestinal (GI) tract that result in GI irritation, internal tissue irradiation, and/or deposition to target organs, and type of work will be described in the SWP or RWP.
- Injection while handling radionuclides and inorganic compounds by breaking of the skin, or migration through an existing wound, resulting in localized irritation, contamination, uptake of soluble contaminants, and deposition of insoluble contaminants.

8.3 Environmental and Personnel Monitoring

The potential for exposure to radiological and nonradiological hazards exists during many of the tasks that will take place during the OU 3-13, Group 5, SRPA and affects all personnel who work in the CRZ and EZ. Refinement of work control zones (Section 7), engineering and administrative controls, worker training, and the use of protective equipment will mitigate most of these hazards to a large degree. Monitoring with direct-reading instruments will be conducted to provide Radcon and IH personnel with real-time data to assess the continued effectiveness of these controls.

The greatest exposure potential(s) during this project will be described in the SWP and/or RWP. IH and Radcon personnel will focus on the activities and monitor with direct-reading instrumentation, swipes, and full and partial period air sampling in accordance with the applicable technical procedures (TPRs), as written for the project, and/or other guidelines as deemed appropriate. Other workers and areas of the site will also be monitored to verify the integrity of core sample packages, to ensure contamination has not migrated from radionuclide-contaminated material areas or waste containers, and to determine the effectiveness of contamination control and decontamination practices.

Personnel working on the project may be exposed to hazardous materials or hazardous physical agents, as already described. Safety hazards and other physical hazards will be monitored and controlled as outlined in Section 8.5.

8.3.1 Industrial Hygiene Monitoring

When there is a potential for the spread of contamination during the drilling process or work associated with the drilling process, characterization monitoring for surface radionuclide contamination may provide an additional indicator of nonradiological hazards. Various direct-reading instruments and other semiquantitative detection tests will be utilized to determine the presence of nonradiological and other physical agents. The frequency and type of sampling and monitoring will be determined by changing site conditions, direct-reading instrument results, observation, and professional judgment of the IH. All full and partial period airborne contaminant sampling will be conducted using applicable NIOSH or OSHA methods and in conformance to the INEEL Safety and Health Manual. Risk assessments for site personnel will be conducted according to MCP-153, "Industrial Hygiene Exposure Assessment."

The IH will conduct baseline sampling for noise and dust as determined necessary by the IH. Generated dust levels have a direct correlation to airborne levels of radionuclide and nonradionuclide contaminants. Sampling will help determine if effective dust control methods are being utilized.

8.3.1.1 Industrial Hygiene Instrument and Equipment Calibration. All monitoring instruments will be maintained and calibrated in accordance with the manufacturer's recommendations, existing IH protocol, and in conformance to the INEEL *Safety and Health Manual*. Direct-reading instruments will be calibrated, at a minimum, prior to daily use and more frequently as determined by the project IH. Calibration information, sampling and monitoring data, results from direct-reading instruments, and field observations will be recorded as described in Section 3.

8.3.2 Radiological Monitoring

During this project, the potential exists for exposure to both external and internal radiation (inhalable, ingestible, or absorbed radioactive contaminants). As with the nonradiological contaminants discussed above, the greatest potential for both external and internal radiation exposures will be described in the RWP and/or work order. Monitoring will be performed in accordance with the INEEL *Radiation Protection Manual*, 15A; MCP-139, "Radiological Surveys"; MCP-425; and MCP-357, "Job-Specific Air Sampling/Monitoring."

Based on the unique and distinctive hazards presented by both external and internal radiation sources, they will be evaluated, controlled, and monitored individually (although the detection of any radionuclides will serve to alert for the presence of both). For purposes of this monitoring section, they will be discussed separately and distinguished by their effects as radiation (external) and contamination (internal). Radiological monitoring will include area, airborne, equipment, and personnel monitoring. Data will be used by RadCon personnel to evaluate the effectiveness of engineering controls, ensure the adequacy of work zone boundaries, alert project personnel to potential high radiation sources, and ensure the effectiveness of decontamination methods and practices.

8.3.3 RadCon Engineer and IH Exposure Assessments

Although the potential for exposure to site contaminants is anticipated to be low for this project, action levels for suspected contaminants are established and presented in Table 8-3 to prevent and mitigate potential personnel exposure. If action levels are reached, personnel will take the appropriate actions listed in Table 8-3.

Table 8-3. Action levels and associated responses for anticipated project hazards.

Contaminant/Agent Monitored	Action Level	Response Taken if Action Levels Exceeded
Hazardous noise levels	<85 dBA 8 hr TWA, <83 dBA 10 hr TWA	No action.
	85–114 dBA	Hearing protection required to attenuate to below 85 dBA 8 hr. TWA or 83 dBA for 10 hr TWA (based device NRR).
	(a) > 115 dBA (b) >140 dBA	(a) Isolate source; evaluate NRR for single device, double protection as needed. (b) Control entry, isolate source, only approved double protection worn.
Radiation field	< 5 mrem/hr	No action, no posting required.
	5–100 mrem/hr @ 30 cm (§835.603.b)	Post as "Radiation Area"—Required items: RW I or II training, RWP, personal dosimetry.
	>100 mrem – 500 rad @ 100 cm (§835.603.b)	Post as "High Radiation Area"—Required items: RW II, RWP, alarming personal dosimetry, dose rate meter, and temporary shielding (as required).
Radionuclide contamination	Exceed RAM alarming set point, if required (fast ringing bell, flashing red light)	Evacuate area immediately, muster at CRZ and await instruction from RCT.
	1–100 times RCM Table 2-2 values (§835.603.d)	Post as "Contamination Area"—Required items: RW II training, personal dosimetry, RWP, don PPE, bioassay submittal (as required).
	>100 times RCM Table 2-2 values (§835.603.d)	Post as "High Contamination Area"—Required items: RW II training, personal dosimetry, RWP (with prejob briefing) don PPE, bioassay submittal (as required).
Airborne radioactivity	Concentrations ($\mu\text{Ci/cc}$) > 10% of DAC value (§835.603.d)	Post as "Airborne Radioactivity Area"—Required items: RW II training, personal dosimetry, RWP (with prejob briefing) don PPE, bioassay submittal (as required).
	Exceed continuous air monitor alarming set point, if required (fast ringing bell, flashing red light)	If not in Level B respiratory protection-evacuate upwind to CRZ, await RCT.
		If in Level B respiratory protection-leave immediate area to upwind location, maintain airline connection and await RADCON instructions.
NRR = noise reduction rating DAF = derived air concentration		dBA = decibel A-weighted RW = radiological worker

8.4 Physical Hazards Evaluation, Control, and Monitoring

The physical hazards present at the project area and the methods that will be used to monitor and control them are described in this section. It is critical that all personnel are aware and understand the nature of the tasks that will be conducted, the equipment to be used, and the controls in place to eliminate or mitigate potential safety hazards.

8.4.1 Temperature Extremes

The OU 3-13, Group 5, SRPA project activities will be conducted during months where there is a potential that both heat and cold stress factors could affect task-site personnel based on ambient air temperatures and layered PPE.

8.4.1.1 Heat Stress. Outside temperatures are expected to be variable throughout the project's duration, and personnel will be required to wear protective clothing that prevents the body from cooling. High ambient air temperatures can result in increased internal body temperature, heat fatigue, heat exhaustion, or heat stroke that can lead to symptoms ranging from physical discomfort, unconsciousness, to death. Personnel must inform the FCC, FTL, or HSO when experiencing any signs and/or symptoms of heat stress, or observe a fellow employee ("buddy") experiencing them. MCP-2704, "Heat and Cold Stress," and Table 8-4 of this section describe heat stress signs and symptoms.

Monitoring for heat stress conditions will be performed according to MCP-2704. Depending on the ambient weather conditions, work conditions, type of PPE worn, and the physical response of work operations personnel, the IH/RCT will inform the FTL of necessary adjustments to the work/rest cycle. Additionally, physiological monitoring may be conducted to determine if personnel are replenishing liquids fast enough. A supply of cool drinking water will be provided in designated eating areas and consumed only in these areas. The IH/RCT or HSO to ensure that the controls are effective and that excessive heat exposure is not occurring may periodically interview workers. Workers will be encouraged to monitor their body signs and to take breaks if symptoms of heat stress occur. The signs of heat stress are listed on Table 8-4.

Individuals showing any symptoms of heat exhaustion listed in Table 8-4 will (1) stop work, (2) exit work area, (3) be decontaminated (as appropriate), (4) remove protective clothing, (5) move to sheltered area to rest, (6) be provided cool drinking water, and (7) be monitored by a medic or CPR/first-aid-certified employee.

Personnel exhibiting signs and/or symptoms of heat stroke will be immediately transported to the nearest medical facility for medical attention. Section 11 details additional emergency situations and associated responses.

Note: *Heat exhaustion and heat stroke are extremely serious conditions that can result in death and should be treated as such. Transport individual immediately to the nearest medical facility.*

Table 8-4. Heat stress signs and symptoms.

Heat-Related Illness	Signs and Symptoms	Emergency Care
Heat rash	Red skin rash and reduced sweating	Keep the skin clean; change all clothing daily; cover affected areas with powder containing cornstarch or with plain cornstarch.
Heat cramps	Severe muscle cramps, exhaustion, sometimes with dizziness or periods of faintness	Move the patient to a nearby cool place; give the patient half-strength electrolytic fluids; if cramps persist, or if signs that are more serious develop, seek medical attention.
Heat exhaustion	Rapid, shallow breathing; weak pulse; cold, clammy skin; heavy perspiration; total body weakness; dizziness that sometimes leads to unconsciousness	Move the patient to a nearby cool place; keep the patient at rest; give the patient half-strength electrolytic fluids; treat for shock; seek medical attention. DO NOT TRY TO ADMINISTER FLUIDS TO AN UNCONSCIOUS PATIENT
Heat stroke	Deep, then shallow, breathing; rapid, strong pulse, then rapid, weak pulse; dry, hot skin; dilated pupils; loss of consciousness (possible coma); seizures or muscular twitching	Cool the patient rapidly. Treat for shock. If cold-packs or ice bags are available, wrap them and place one bag or pack under each armpit, behind each knee, one in the groin, one on each wrist and ankle, and one on each side of the neck. Seek medical attention as rapidly as possible. Monitor the patient's vital signs constantly. DO NOT ADMINISTER FLUIDS OF ANY KIND

8.4.1.2 Low Temperatures. Exposure to low temperatures will likely be a factor during the time of project activities. Cool ambient temperatures and wet and/or windy conditions potentially increase chances of cold injury to personnel. The project IH and HSO will be responsible for obtaining meteorological information to determine if additional cold stress administrative controls are required. MCP-2704 discusses the hazards and monitoring of cold stress. Project personnel will also be cautioned regarding cold stress factors associated with rapid cooling once impermeable PPE layers are removed causing the potential freezing of accumulated moisture on PPE outer and inner surfaces, under extremely cold conditions. (See Section 9, Table 9-2 for requirements that must be followed for the outer layer of protection based on radiological and nonradiological hazards.) The following are provided as general measures for inner clothing layers to prevent cold stress:

- Insulated suits, such as whole-body thermal underwear
- Wool or polypropylene socks to keep moisture off the feet if there is a potential for work activity that could cause sweating
- Insulated glove liners when air temperatures are extremely low (less than 10°F [-15°C]), gloves with reflective surfaces, which reflect body heat back to the hand, should be used)
- Insulated boots, head cover such as hard hat liners.

At air temperatures below 30°F (-1°C), the following work practices should be followed:

- If the clothing of a worker might become wet on a job site, the outer layer of the clothing must be impermeable to water.
- If a worker's underclothing becomes wet, the worker must change into dry clothing immediately; however, if the clothing becomes wet from sweating, the worker may finish the task that caused the sweating before changing into dry clothing.
- Workers will be provided a warm area (65°F [18.3°C] or above) to change from work clothing into street clothing.
- Workers will be provided a warm break area (60°F [15.6°C] or above).
- If appropriate, space heaters may be provided in the work area to warm the hands, feet, etc.
- Hot liquids, such as soups or sweet drinks, will be provided in the break area; the intake of caffeine will be limited because of diuretic and circulatory system effects.
- The buddy system will be practiced at all times; any personnel observed with severe shivering will leave the cold area immediately.
- Workers should layer their clothing (i.e., thinner, lighter clothing layered under heavier clothing).
- To prevent heat stress, workers should dress appropriately for going into warm areas or performing strenuous activities.
- Workers handling liquids that evaporate easily (gasoline, diesel fuel, etc.) will take special precautions to avoid soaking clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.
- Work will be planned to minimize the need for workers to sit still or stand for long periods.

Additional cold weather hazards exist from working on snow- or ice-covered surfaces. Slip, fall, and material handling hazards are increased under these conditions. Every effort must be made to ensure walking/working surfaces are kept clear of ice, snow, or other slippery conditions. The FTL or HSO should be notified immediately if slip or fall hazards are noted during the project.

8.4.2 Noise

Personnel working at the project site may be exposed to noise levels that exceed 85-decibel weighted average (dBA) for 8-hour time weighted average (TWA) and 83 dBA for 10-hour TWA during (describe noise areas on the SWP and/or work order). The effects of high sound levels (noise) may include the following:

- Personnel being startled, distracted, or fatigued
- Physical damage to the ear, pain, and temporary or permanent hearing loss

- Interfere with communication that would warn of danger.

Noise measurements will be performed by the IH per MCP-2719, "Controlling and Monitoring Exposure to Noise," to determine if personnel assigned to the jobs identified are above allowable noise exposure levels. A TLV of 85 dBA (time-weighted average) will be applied to personnel exposed to noise levels over no more than an 8-hour day. This level is based on a 16-hour "recovery" period in a low noise environment. If personnel are required to work longer than 8 hours in a hazardous noise environment, then the TLV will be adjusted to a lower value. The project IH must be consulted regarding modifications to the 85 dBA for 8-hour TLV and 83 dBA for 10-hour TWA value.

Personnel whose noise exposure meet or exceeds the allowable level will be enrolled in the INEEL OMP or subcontractor Hearing Conservation Program. Personnel working on jobs that have noise exposures greater than 85 dBA (83 dBA for 10-hour TWA) will be required to wear hearing protection until noise levels have been evaluated and will continue to wear the hearing protection specified by the IH until directed otherwise.

8.4.3 Fire, Explosion, and Reactive Materials Hazards

Fire, explosion, and reactive materials hazards at the project include potential explosive atmospheres, combustible materials near ignition sources (hot motor or exhaust system), transfer and storage of flammable or combustible liquids in the SZ, and chemical reaction (reduction, oxidation, exothermic, etc.) from incompatible waste materials. Portable fire extinguishers, with a minimum rating of 10A/60BC will be strategically located at the site to combat Class ABC fires. They will be located in all active work areas, on or near site equipment that have exhaust heat sources, and on or near all equipment capable of generating ignition or having the potential to spark. All project field team members will receive fire extinguisher training, as necessary, as part of this HASP training, as listed in Section 4, Table 4-1.

8.4.3.1 Project Equipment Fire Hazards. Combustible or ignitable materials in contact with or near exhaust manifolds, catalytic converters, or other ignition sources could result in a fire. The project fire protection engineer will identify these sources as equipment is brought on the site. The accumulation of combustible materials will be strictly controlled during the project. Disposal of combustible materials will be assessed at the end of each shift. Class A combustibles such as trash, cardboard, rags, wood, and plastic will be properly disposed in metal receptacles in the SZ and in appropriate waste containers within the CRC, CRZ and EZ.

Fuels used at the project site for equipment will be safely stored, handled, and used. Only FM/UL-approved flammable liquid containers, labeled with the content, will be used to store fuel. All fuel containers will be stored at least 15 m (50 ft.) from any facilities (trailers) and ignition sources, or stored inside an approved flammable storage cabinet. Additional requirements are provided in MCP-584, "Flammable and Combustible Liquid Storage and Handling." Portable motorized equipment such as generators, light plants, etc., will be shut off and allowed to cool down in accordance with the manufacturer's operating instructions prior to refueling to minimize the potential for a fuel fire. Refueling tasks will only be conducted by qualified fuel handling personnel.

8.4.4 Biological Hazards

Well drilling and sampling sites near the RWMC are located in an area that provides habitat for various rodents, insects, and reptiles. Based on biological studies done at the INEEL, deer mice have been known to carry the Hantavirus. The virus is present in the nesting and fecal matter of deer mice. A

potential exists for project personnel to disturb nesting or fecal matter during the course of mobilization and intrusive activities. If such materials are disturbed, they can become airborne and create a potential inhalation pathway for the virus. In addition, contact and improper removal of these materials may provide additional inhalation exposure risks.

If personnel encounter suspect rodent nesting or excrement material, the project IH will be notified immediately and no attempt will be made to remove or clean the area. Following an evaluation of the area, a safe work permit (SWP) will be written for disinfecting and removing the matter from the project task area. The IH will provide the necessary guidance for protective equipment, mixing, and application of the disinfecting solution (bleach solution), and proper disposal method of the waste.

Snakes and insects (spiders, ticks, and mosquitoes) may also be encountered at the well drilling and sampling sites. Common areas to avoid include around material stacking/staging areas, under existing structures (trailers, buildings, etc.), under boxes, and other areas that provide shelter for snakes. Protective clothing will prevent insects from direct contact with personnel; however, insect repellent may be required during Level D activities. Avoid areas where standing water has accumulated, providing breeding grounds for mosquitoes. In cases where large areas of standing water are encountered, it may be necessary to pump it dry or add a small concentration of nonhazardous surfactant to the water to break the surface tension (mosquito hatching phases). Consult with the HSO and project environmental coordinator before adding surfactant to standing water areas.

8.4.5 Confined Spaces

No confined space entries are anticipated for this project.

8.4.6 Safety Hazards

Industrial safety hazards pose a significant, if not the most likely, threat to personnel that will be encountered while performing tasks during this project. Section 6 provides general safe-work practices that must be followed at all times. The following sections describe specific industrial safety hazards and procedures to be followed to eliminate or minimize potential hazards to project personnel.

8.4.6.1 Handling Heavy Objects. During the course of any drilling project, numerous tasks require handling or moving heavy objects. Manual material handling will be minimized through task design and use of mechanical and/or hydraulic lifts whenever possible.

8.4.6.2 Powered Equipment and Tools. All power equipment and tools will be properly maintained and used according to the manufacturer's specifications by qualified individuals. MCP-2735, "Hand and Portable Power Tools," will be followed for all work performed with powered equipment including powered steam cleaners.

8.4.6.3 Heavy Equipment and Moving Machinery. The hazards associated with the operation of heavy equipment include injury to personnel, equipment damage, and/or property damage. All heavy equipment will be operated in the manner in which it was attended and according to the manufacturer's instructions. Only authorized personnel will be allowed in the vicinity of operating heavy equipment and should maintain visual communication with the operator. Work-site personnel will comply with MCP-2745, "Heavy Industrial Vehicles," MCP-2743, "Motor Vehicle Safety," and MCP-2744, "Powered Industrial Trucks."

Site personnel working around or near heavy equipment and other moving machinery will comply with the appropriate INEEL Safety and Health Manual MCPs and DOE-STD-1090-96, *Hoisting and Rigging*. Additional safe practices will include

- All heavy equipment will have backup alarms.
- Walking directly in back of or to the side of heavy equipment without the operator's knowledge will be prohibited; all precautions will have been taken prior to moving heavy equipment.
- While operating heavy equipment in the work area, the equipment operator will maintain communication with a designated person responsible for providing direct voice contact or approved standard hand signals; in addition, all site personnel in the immediate work area will be made aware of the equipment operations.
- All equipment will be kept out of traffic lanes and access ways and will be stored so as not to endanger personnel at any time.

8.4.6.4 Electrical Hazards/Energized Systems. Electrical equipment and tools as well as underground lines may pose shock or electrocution hazards to personnel. Safety-related work practices will be employed to prevent electric shock or other injuries resulting from direct or indirect electrical contact. If work on energized systems is necessary, these practices will conform to the requirements in MCP-2731, "Electrical Safety"; MCP-3650, "Chapter IX Level I Lockouts and Tagouts"; MCP-3651, "Chapter IX Level II Lockouts and Tagouts"; facility supplemental MCPs; and Parts I through III of NFPA 70E. In addition, all electrical work will be reviewed and completed under the appropriate work controls (i.e., HASP, SWPs, work orders).

Before beginning any subsurface penetrations, underground utility clearances will be obtained by contacting telecommunications (526-1688 or 526-2512). Subsurface investigation clearance will be obtained in accordance with MCP-151, "Subsurface Investigations." The requirements for advanced 48-hour notice will be met.

8.4.6.5 Personal Protective Equipment. Wearing PPE will reduce a worker's ability to move freely, see clearly, and hear directions and noise that might indicate a hazard. In addition, PPE can increase the risk of heat stress. Work activities at the project site will be modified as necessary to ensure that personnel are able to work safely in the required PPE. Work-site personnel will comply with MCP-2716, "Personal Protective Equipment," and MCP-432, "Radiological Personal Protective Equipment." The OU 3-13, Group 5, SRPA Project PPE levels for each task are described in Section 9 and listed in Table 9-1 of that section.

8.4.6.6 Decontamination. Decontamination procedures for personnel and equipment are detailed in Section 10. The appropriate INEEL MCPs provides additional requirements for chemical and radionuclide decontamination requirements.

Personnel must follow decontamination procedures, (Section 10) applicable MCPs, and the appropriate level of PPE worn during decontamination activities. Project RadCon and IH personnel will follow MCP-148, "Personnel Decontamination"; and Company Manual 14B, *Safety and Health-Occupational Health*; MCPs; and general IH practices.

8.4.6.7 Inclement Weather Conditions. When inclement or adverse weather conditions develop that may pose a threat to persons or property at the project site (such as sustained strong winds 25 mph or greater), electrical storms, heavy precipitation, or extreme heat or cold) these conditions will be evaluated

and a decision made by the FTL and JSS, with input from the HSO, IH, SE, RCT, and other project personnel, as appropriate, to stop work, employ compensatory measures, or to proceed. The FTL and JSS will comply with INEEL MCPs and site work control documents that specify limits for inclement weather.

8.4.7 Drilling Hazards

Air rotary drilling (or equivalent) will be used to core to the required depths. Drilling personnel will be aware of potential drilling equipment hazards and body positioning during all material handling tasks. Specific hazards associated with drill rigs are described below.

8.4.7.1 Slips. Slips are toothed wedges positioned between the drill pipe and the master bushing or rotary cable to suspend the drill string enclosure in the well bore when it is not supported by the hoist. Most accidents associated with slip operations are related to manual materials handling; strained backs and shoulders are common.

8.4.7.2 Tongs. Tongs are large, counter-weighted wrenches used to break apart torqued couplings on the drill pipe. Both sets of tongs have safety lines; when breakout force is applied to the tongs, the tongs or the safety lines could break and injure a worker standing near them. Accidents can occur when the driller activates the wrong tong lever and an unsecured tong swings across the rig floor at an uncontrolled velocity. A common accident attributable to tongs can occur when a worker has a hand or finger in the wrong place in attempting to swing and latch the tong onto the drill pipe, resulting in crushing injuries to or amputation of the fingers.

8.4.7.3 Elevators. Elevators are a set of clamps affixed to the bails on the swivel below the traveling block. They are clamped to each side of a drill pipe and hold the pipe as it is pulled from the well bore. Accidents and injuries can occur during the latching and unlatching tasks; fingers and hands can get caught and crushed in the elevator latch mechanism. If the pipe is overhead when the latching mechanism fails, the pipe may fall on workers working on the drill floor.

8.4.7.4 Catlines. Catlines are used on drilling rigs to hoist material. Accidents that occur during catline operations may injure the worker doing the rigging as well as the operator. Minimal control over hoisting materials can cause sudden and erratic load movements, which may result in hand and foot injuries.

8.4.8 Dust Control

During all site activities, project Radcon and IH personnel will determine if wind or other weather conditions pose unacceptable exposure hazards to personnel or the environment. Methods such as surfactants, wetting, and enclosures may be used to assist with dust control. Administrative controls such as designating routes of travel or restricting access to areas may also be implemented

Engineering or administrative controls such as dust hog units, wetting, and discharge line positioning to reduce dust sources. When handling materials such as bentonite and sand, reduce personnel exposure to dust by positioning upwind, use wetting, or use of PPE as determined by the IH based upon tasks.

8.5 Other Site Hazards

Site personnel should continually look for potential hazards and unsafe acts, and immediately inform the FTL or HSO of the hazards so immediate action can be taken to correct the condition.

The FTL, HSO, RCT, and JSS will conduct daily inspections of the project site to ensure that barriers and signs are being maintained, unsafe conditions are corrected, debris is not accumulating on the site, and unsafe acts discussed and discouraged. These inspections will be noted in the FTL logbook. Health and safety professionals present at the project site may at any time, recommend changes in work habits to the FTL. However, all changes that may affect the project's written work control documents (HASP, RWPs, SWPs), must have concurrence from the appropriate project technical discipline representative onsite and a data analysis report prepared as required.

Personnel working at the project site are responsible to use safe-work techniques, report unsafe working conditions, and exercise good personal hygiene and housekeeping habits throughout the course of their job.